

Analysis of the Impact of Money Supply on Balance Of Payments in Nigeria

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Abstract

The question of whether the supply of money (M) is fixed exogenously by the monetary authorities, or should be regarded as endogenous to the system which determines the level of income, rate of interest etc., has been the subject of most recent debate. In macroeconomic theory M has generally been assumed to be exogenous. In practice monetary authorities do to some extent adjust the money supply passively in response to changes, explaining the money supply within our models. However, the comparative static analysis of the models to be developed is not substantially affected by the assumption that money supply is exogenous and constant unless the monetary authority makes a deliberate change. This study therefore sought to analyse the impact of money supply on BOP in Nigeria. This study used secondary data sourced from Central Bank of Nigeria Statistical Bulletin (1986-2021) in its analysis. The study employed Auto-Regressive Distributed Lag (ARDL) to estimate the short run and long run impact of the money supply on BOP in Nigeria. The ARDL bound co-integration showed a long run negative and insignificant relationship between BOP and money supply in the country. The study recommended that the monetary authorities and the financial institutions be made to be effective in handling the economy's financial flow that has led to the disequilibrium on Balance of payment (BOP) deficit.

Keywords: Money supply, Balance of Payment, Monetary Approach, Co-integration Test, Auto-Regressive Distributed Lag (ARDL)

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I. Background To The Study

In economics, the money supply refers to all of the cash and currency in circulation within a country. A country's money supply has significant effect on a country's macroeconomic profile, particularly in relation to interest rates, inflation, and the business cycle. In America, the Federal Reserve determines the level of monetary supply. Among the money supply on economic stability are Monetarism and Austrian Business Cycle Theory. In macroeconomics, the money supply refers to the total volume of money held by the public at a particular point in time in an economy. There are several ways to define money, but standard measures usually include currency in circulation and demand deposits. In other words, money supply is all the currency and other liquid instruments in a country's economy on the date measured. The money supply roughly includes both cash and deposits that can be used almost as easily as cash. Government regularly Issue paper currency and coin through some combination of their central banks and treasuries. Bank regulators influence the money supply available to the public through the requirements placed on banks to hold reserves, how to extend credit and money matters, (Investopedia Team, peter and Ariel, 2021).

From economic theory, an increase in money supply leads to an increase in the total money in circulation in the economy thereby making more money available for investment, productivity increase, output and increased aggregate demand in the economy. This is possible if the government decides to embark on expansionary monetary policy and this can lead to better Balance of payments position especially when the money supply does not exceed money demand in the economy (CBNSB, 2021).

Again, an increase in the supply of money typically lowers interest rates, which in turn, generates more investment and puts more money in the hands of consumers, thereby stimulating spending and business responds by ordering more raw materials and increasing production. The increased business activity raises the demand for labour. The opposite can occur if money supply falls or when its growth rate declines. Change in money supply has long been considered to be a key factor in driving macroeconomic performance and business cycles. Macroeconomic schools of thought that focus heavily on the role of money supply include Irving Fisher's Quantity Theory of Money, Monetarism, and Austrian Business Cycle Theory. However, since 2000, these relationships have become unstable, reducing their reliability as a guide for monetary policy. Although money supply measures are still widely used, they are one of a wide array of economic data that economists and the Federal Reserve collect and review (Investopedia Team, peter and Ariel, 2021).

Objective of the Study

The main objective of this study is to analyze the implication of money supply on the balance of payment in Nigeria.

II. Review Of Related Literature

2.1 The Monetary Approach

The monetary approach focuses on both the current and capital accounts of the balance of payments. This is quite different from the elasticity and absorption approaches, which focus on the current account only. The general view of monetary approach makes it possible to examine the balance of payments not only in terms of the demand for goods and services, but also in terms of the demand for the supply of money. This approach also provides a simplistic explanation to the long run devaluation as a means of improving the balance of payments, since devaluation represents an unnecessary and potentially distorting intervention in the process of equilibrating financial flows, (Crockett, 1977).

The approach also sees balance of payments as regards international reserve to be associated with imbalances prevailing in the money market. This is because in a fixed exchange rate system, an increase in money supply would lead to an increase in expenditure in the forms of increased purchases of foreign goods and services by domestic residents. To finance such purchases, much of the foreign reserves would be used up, thereby worsening the balance of payments. As the foreign reserve flows out, money supply would continue to diminish until it equals money demand, at which point, monetary equilibrium is restored and outflow of foreign exchange reserve is stopped. Conversely, excess demand for money would cause foreign exchange reserve in flows, domestic monetary expansion and eventually balance of payment equilibrium position is restored. The monetary approach is specifically geared towards an explanation of the overall settlement of a balance of payments deficit or surplus. If the supply of money increases through an expansion of domestic credit, it will cause a deficit in the balance of payments, an increase in the demand for goods and various assets and decrease in the aggregate in the economy. Monetary policy entails a policy strategy which the Central Bank employs to control the supply of money stock so as to achieve general macroeconomic goals such as Balance of Payments (BOPs) equilibrium. In most instances, the specific objective and focus of monetary policy changes from time to time, depending on the level of economic development and fortunes of the country (Nyong and Obafemi, 1995; CBN, 2010).

Monetary Approach to Balance of Payment (MABP) shows that the overall balance of payments (measured by international reserves) is influenced by imbalances prevailing in the money market. Further argument is that under a system of fixed exchange rates excess money supply induces increase expenditure, hence increased domestic demand for foreign goods and services. The high domestic demand needs to be financed by running down foreign exchange reserves, thereby worsening the balance of payments. He further explained that the outflow of foreign exchange reserves reduces money supply until it is equal to money demand, thereby restoring monetary equilibrium and halting an outflow of foreign exchange reserves. Therefore an excess demand for money leads to opposite adjustment, which in turn induces foreign exchange reserves inflow, and hence causes a BOP surplus. This triggers domestic monetary expansion and eventually a restored balance of payments equilibrium position is achieved, (Akpasung&Babalola, 2013).

2.2. EMPIRICAL FRAMEWORK

Different scholars and researchers have reviewed the determinants of balance of payments in different countries. Below are some of the reviews carried out by researchers.

Osisanwo, (2015) explored the impact of Balance of Payments deficit and monetary policy on the economic growth of Nigeria from 1980 -2013 employing the dynamic econometric model. The result showed a long-run relationship between Balance of Payments and monetary policy and Nigeria. It recommended that the central authority should adopt a policy of export promotion and flexible rate regime.

The research study by Imoughele and Ismaila (2015) investigated the monetary policy impact on the Balance of payments (BOP) in Nigeria from 1986 -2013. Based on the method used, Error Correction Model (ECM) technique and result showed that long-run relationship exists among the monetary policy variables and Balance of payments. Result of the analysis indicate that monetary policy variables such as exchange rate, broad money supply and credit loaned to the private sectors constitute the major monetary factors that impact seriously on Balance of payments in Nigeria.

The objective of the study by Udedu (2014) investigated empirically the impact of monetary policy on Nigeria's Balance of payments using Ordinary Least Squares (OLS) technique of multiple regression model, Augmented Dickey-Fuller test and Johansen Co-integration test from 1980-2010. From the result, it was concluded that there exist a positive and a statistically significant relationship between monetary policy, exchange rate and Balance of payments.

In Nigeria, Onwe (2014) investigated the effects of monetary policy variables on the Balance of payments by adopting Co-integration approach of econometric analysis and the empirical result from the Co-integration estimation indicated that there is a positive relationship existing between the monetary policy variables such as money supply, interest rate, gross domestic product and exchange rate on the Balance of payment as a dependent variable in the model. However, the result further indicated that only interest rate and money supply were significant but exchange rate was found to be insignificantly related with Balance of payments.

Imoisi, Olatunji and Ekpenyong (2013) similarly carried out a study on the efficacy of monetary policy in achieving Balance of payments stability in Nigeria within the period 1980 to 2010. The study employed the Ordinary Least Squares (OLS) technique of multiple regressions and the estimated result found a positive relationship between the monetary variables of money supply, exchange rate, interest rate and BOPs. Furthermore, the study indicated a positive significant relationship between broad money supply (M2) and interest rate (ITR) with BOPs while exchange rate (EXR) was found to be statistically insignificant.

In the view of Nwani (2012), balance of payments crisis distorts the workings of the entire system (economy) because it creates disequilibrium between the supply and demand for money. Balance of payments disequilibrium is a reflection of disequilibrium in the money market. Monetary disequilibrium produces adverse effect on the aggregate expenditure for goods and services (absorption) in the sense that, if the public has an excess supply of money it gets rid of it by passing its excess cash balance to foreign countries in exchange for goods and services. If the public desires to keep more money than it has in stock, it achieves it by reducing absorption and ultimately passes goods and services on in foreign countries in exchange for money. It is apparent that the Balance of Payments position in the country has reached an unviable proportion and has become a binding constraint in the realization of government objectives.

III. Methodology

3.1 MODEL SPECIFICATIONS

Given that this study aims at analysing the impact of Money Supply on balance of payments in Nigeria, the functional form of the model specification is specified as:

$$BOP = f(INTR) \dots\dots\dots (3.1)$$

Where: BOP = Balance of payment, MOS = Money Supply

To estimate the above equation, we transformed the functional form into an estimated model as:

$$BOP_t = \alpha_0 + \alpha_1 MOS_t + \mu_t \dots\dots\dots (3.2)$$

The Auto Regressive Distributed Lag (ARDL) Model which uses a bounds test approach based on unrestricted error correction model (UECM) was employed here to estimate the effects of selected macroeconomic variables on balance of payment in Nigeria. The ARDL model was developed by Pesaran (1997) and used by Pesaran, et al (2001); Masron (2009); Owusu (2012), among others. The major advantage of this approach is based on the fact that it can be applied irrespective of whether the variables are I (0) or I (1). This approach also allows for the model to take a sufficient number of lags to capture the data generating process in a general-to-specific modelling framework. Although, a dynamic error correction model (ECM) can be derived from ARDL through a simple linear transformation, Banerjee et al., 1998 and Pesaran et al., 2001, have introduced bound testing as an alternative to test for the existence of co-integration among the variables. The bounds test procedure is merely based on an estimate of unrestricted error correction model (UECM) using ordinary least squares estimator. Tang (2003) argues that the UECM is a simple re-parameterization of a general ARDL model. The ARDL model is stated as:

$$BOP_t = \alpha_0 + \sum_{i=0}^p \gamma_i BOP_{t-i} + \sum_{i=1}^q \beta_i MOS_t + \mu_{it} \dots\dots\dots (3.3)$$

In order to obtain the co-integrating equation, equation 3.3 is transformed into 3.4 as follows:

$$\Delta BOP_t = \alpha_0 + \sum_{i=0}^p \gamma_i \Delta BOP_{t-i} + \phi_4 MOS_t + \phi_1 ECT_t + \mu_{it} \dots\dots\dots (3.4)$$

Where $ECT_t = Y_t - \alpha_0 - \sum_{i=1}^p \gamma_i \Delta Y_{t-i} - \sum_{i=0}^p \beta_i \Delta X_{t-i}$ and $\phi = 1 - \sum_{i=1}^p \gamma_i \Delta Y_{t-i} \dots\dots\dots (3.5)$

The Bound test procedure used equations 3.4 and 3.5 into 3.6 as:

$$\Delta Y_t = -\sum_{i=1}^{p-1} \gamma_i Y * \Delta Y_{t-i} + \sum_{i=0}^p \beta_i \Delta X_{t-i} - \rho Y_{t-1} - \alpha - \sum_{i=0}^p \delta X_{t-i} + \mu_{it} \dots\dots\dots (3.6)$$

Then we test the existence of level relationship as $\rho = 0$ and $\delta_1 = \delta_2 = \dots = \delta_k = 0$

Where Δ = difference operator, μ = white noise error term.

3.2 UNIT ROOT AND CO-INTEGRATION TEST RESULTS

Since the validity of the ARDL approach relies on $I(0), I(1)$ or a combination of both, it is important to first determine the time-series properties of individual variable that enter equation (3.3). This is done to know whether the variables are integrated of order zero or one or even more. Given that unit root testing procedures have their own limitations. Two unit root tests were considered for this research. These are the non-parametric Philip-Perron (PP) test proposed by Phillips and Perron (1988) and the popular Augmented Dickey-Fuller (ADF) unit root test. Both the ADF and the PP test the null hypothesis that the series have unit root (variables not stationary).

3.3 DATA SOURCE AND ECONOMETRICS SOFTWARE.

The data used in this study obtained from Central Bank of Nigeria (CBN) statistical bulletin 2021, the bureau of statistics 2021. The E-views 10.0 software was used in analysing the data while the Ms-Excel was used to transport the data.

IV. Data Analysis, Findings And Interpretation

This chapter presents analysis and findings of the study as set out in the research objective and research methodology. The study findings are presented on the impact of money supply on balance of payment in Nigeria. The data was collected from secondary source, which included the records at Central Bank of Nigeria and Nigeria National Bureau of Statistics.

4.1 UNIT ROOT TEST

In this study, the Augmented Dickey-Fuller (ADF) unit root test was employed to test for the time series properties of the model variables. This is necessary as it helps to avoid spurious regression results. The ADF tests the null hypotheses that the series has a unit root (not stationary) as against the alternative that the variable has no unit root. The choice of lag length was based on Akaike and Schwartz-Bayesian information criteria and was selected automatically by E-views. The decision rule is to reject the null hypothesis if the ADF statistic value exceeds the critical value at a chosen level of significance (in absolute term). These results are presented in table 1 below.

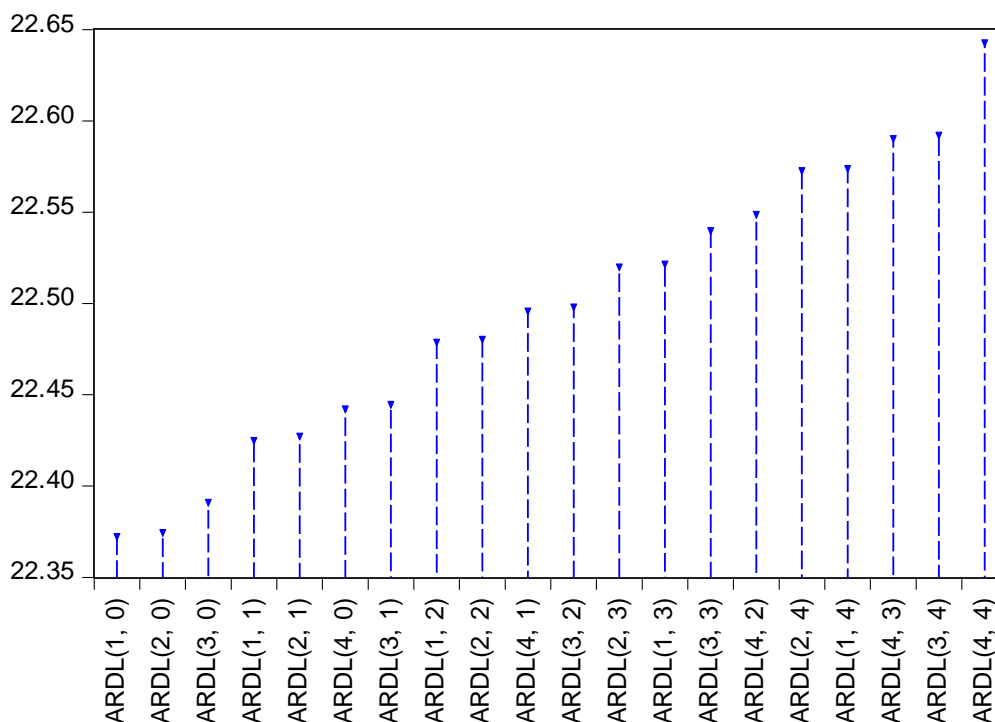
Table 1: Summary of ADF test results at 1% and 5% critical value

Variables	ADF Statistics		ADF Critical Value		Optimum Lag Length	Order of Integration	Remark
	Level	Ist Diff	1%	5%			
BOP	-3.9614		-3.6056	-2.9369	0	I (0)	Stationary
Ln(MOS)	-1.3013	-4.0023	-3.6105	-2.9389	0	I (1)	Stationary

Source: Computed by the Researcher with Eview 10

From table 1 above, observe that the variables EXR, INTR and LnMOS were not stationary at level form but became stationary after first difference which implies that the variables are integrated of order one ($I \sim (1)$) whereas the variables BOP and INF were integrated of order zero ($I \sim (0)$) as they were stationary at level form. The decision was based on the fact the ADF statistics was greater than the critical values at 5% significance level. Since the variables are integrated of order one and zero and none of the variables is integrated of order two. We therefore, applied the ARDL bound co-integration test. But before we apply the ARDL bound co-integration test, we first determined the optimum lag length using Akaike information criteria. The result is shown in figure 1 below:

Figure 1: ARDL Optimum Lag Length Selection
Akaike Information Criteria



After twenty (20) models automatically generated, ARDL (1, 0) model was chosen based on Akaike information criteria.

4.2 ARDL BOUND COINTEGRATION TEST

A necessary condition for testing ARDL bound co-integration test is that the variables be integrated of either of order one or zero or both (Pesaran, Shin and Smith, 2001). Since all the variables were integrated of order one and zero, we proceeded to estimate the ARDL bound test. The null hypothesis of ARDL bound co-integration is that the variables are not co-integrated as against the alternative that they are co-integrated. The decision rule is to reject the null hypothesis if the F-statistics is greater than the upper bound critical values at chosen level of significance. The result of the ARDL bound co-integration test is shown in table 2 below.

Table 2: ARDL Bound Co-integration Test Result

F-Statistics	K	Significance level	Critical Bound Value	
			10 (Lower Bound)	11 (Upper Bound)
5.134656	4	5%	3.62	4.16

Source: Author's computation

From table 2 the F-statistics is greater than the upper bound at 1% level of significance. Thus, we reject the null hypothesis and conclude that there exists a long run relationship between balance of payment (BOP) and selected macroeconomic variables in Nigeria. Therefore, we estimate the parsimonious result of the relationships between BOP and the selected macroeconomic variables in the country.

4.3 AUTOREGRESSIVE DISTRIBUTED LAG (ARDL) RESULT

4.3.1 Short Run Parsimonious ARDL Result

The summary of Short Run Parsimonious ARDL result of the impact of selected macroeconomic variables on balance of payment in Nigeria is presented in table 3.

Table 3: Summary of Short Run Parsimonious ARDL Result

ARDL Model (2, 0)

Variables	Dependent Variable D(BOP)			
	Coefficient	Std. Error	t-statistics	Probability
ECT(-1)	-0.586847***	0.145639	-4.029468	0.0003
R-squared = 0.293946; Adj R-Squared = 0.293946				

***[**] denotes significant of variable at 1% [5%] significance level respectively.

Interpretation of Short Run Result

The coefficient of determination and its adjusted R-Square are 0.2939 and 0.2939 respectively. This shows a poor fit of the model and further suggests that about 29% of the variations in BOP position are explained by changes in the money supply included in the model.

The coefficient of error correction term which measures the speed of adjustment to the long run equilibrium is rightly signed and significant. Specifically, the coefficient of -0.587 implies that about 58.7% of the disequilibrium in the country’s BOP is corrected every year. This further suggests that it takes one year and one month for any disequilibrium in BOP position to be corrected by the selected macroeconomic variables.

4.3.2 Long Run ARDL Result

The summary of Long Run ARDL result of the impact of selected macroeconomic variables on balance of payment in Nigeria is presented in table 4

Table 4: Long Run ARDL Result

Variables	Dependent Variable BOP			
	Coefficient	Std. Error	t-statistics	Probability
Constant	-5563.732	3437.629	-1.618480	0.1141
BOP(-1)	-0.586847***	0.149587	-3.923127	0.0004
MOS	-0.063485	0.214114	-2.296501	0.7685

***[**] denotes significant of variable at 1% [5%] significance level respectively.

Interpretation of the Long Run Result.

The long run result in table 4 shows that money supply have negative and insignificant influence on BOP position in Nigeria. Investigation to establish if balance of payments can be determined through the monetary approach in Kenya was carried out by Osoro (2013) with annual data spanning from 1963 -2012. The study utilized Co-integration and Error Correction Modeling test. From the empirical result, it was found that some of the variables used exhibited non-stationarity and were considered as variables that are insignificant in determining Balance of payments in the long run analysis whereas other variables suggested some level of co-integration in the balance of payments position. The study concludes that balance of payments is a monetary and real phenomenon in Kenya. On the contrary, Imoisi, Olatunji and Ekpenyong (2013) similarly carried out a study on the efficacy of monetary policy in achieving Balance of payments stability in Nigeria within the period 1980 to 2010. The study employed the Ordinary Least Squares (OLS) technique of multiple regressions and the estimated result found a positive relationship between the monetary variables of money supply, and BOPs. Furthermore, the study indicated a positive significant relationship between broad money supply (M2) and interest rate (ITR) with BOPs while exchange rate (EXR) was found to be statistically insignificant.

4.5: Discussion of Test of Hypothesis

Hypothesis 1

H₀: Money supply does not have any statistical significant impact on the balance of payment in Nigeria.

From table 4 above, the probability value for money supply (MOS) is greater than 0.05. Given that the p-value (MOS) is greater than 0.05, we accept H₀ and conclude that money supply has indeed no statistical significant impact on balance of payment in Nigeria.

4.6. EVALUATION OF RESULT BASED ON ECONOMETRIC CRITERIA (2ND ORDER TEST)

4.6.1 Breusch-Godfrey Serial LM Test for Auto- Correlation

The underlying assumption of autocorrelation is that the successive values of the random μ_t are temporally independent. The Breusch-Godfrey Serial Correlation statistics is used to test for the presence of autocorrelation of order q in the models.

Table5: Breusch-Godfrey tests

	F-Statistics	Probability
Breusch-Godfrey LM test for autocorrelation	1.716566	0.1945

From table 5 above, the probability value of B-Q statistics is greater than 0.05. Since the B-Q statistics is greater than 0.05, we accept the alternative hypothesis and therefore conclude that there exists no q order serial auto-correlation of stochastic error terms in the model.

4.6.2 Test for Heteroscedasticity

The primary reason to test for heteroscedasticity after running for OLS is to detect violation of assumption OLS:5, which is one of the assumptions needed for the usual statistics accompanying OLS regression to be valid. The F – statistics can be used to verify this assumption, and the hypothesis is formulated as follow:

Hypothesis

H₀: (There is no heteroscedasticity, i.e. homoscedasticity)

H₁: (There is heteroscedasticity)

Decision Rule; Reject H₀ if the calculated F value is greater than the tabulated F value, otherwise accept H₀. The heteroscedasticity result is as presented in table 11:

Table 6: Breusch-Pagan-Godfrey Heteroskedasticity Test

F-statistic	0.420068	Probability	0.6601
Obs*R-squared	0.888090	Probability	0.6414

Following the above result, calculated F value =0.420068 and its probability value =0.6601. Therefore, since the calculated value of F is insignificant, we accept H₀ of homoscedasticity and conclude that the conditional variances of the error terms are equal. However, on the basis Observed R-Squared and Scaled explained SS, we conclude that the conditional variances of the terms are unequal.

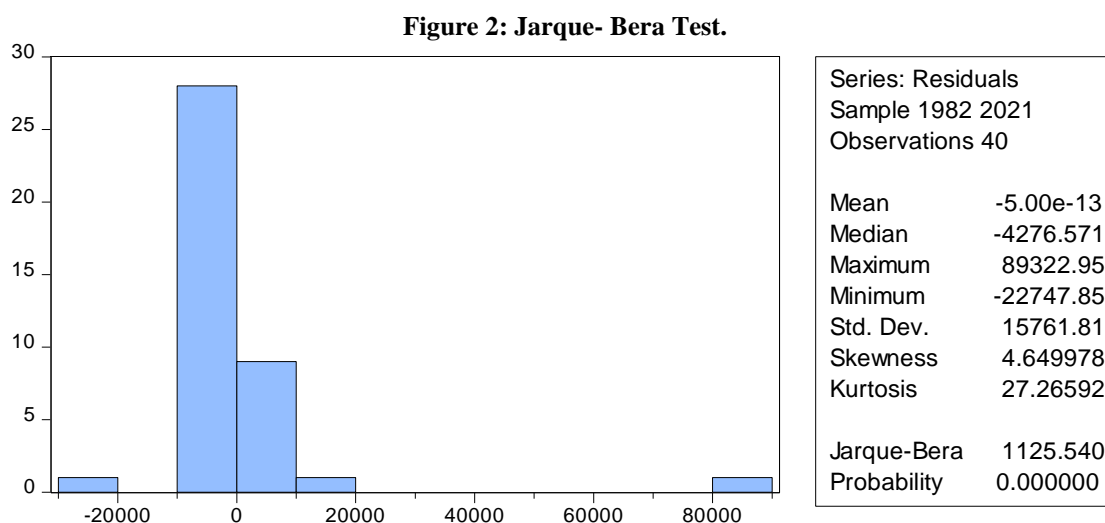
4.6.3 Normality Test

This test is to enable us determine whether the residual follows the normal distribution as postulated by classical OLS assumption. This is tested using the Jarque-Bera test. The hypothesis is formulated as follows:

H₀: $\mu = 0$ (Residual follow normal distribution)

H₁: $\mu \neq 0$ (Residual does not follow normal distribution)

The Jarque- Bera test result is presented in Figure 2 below:



Evidently, the null hypothesis cannot be rejected since the Jarque- Bera probability is 0.000000 (< 0.05). Thus we reject H₀ and conclude that the residual did not follow normal distribution and that the assumption of normal distribution is hereby not satisfied.

4.6.4 Ramsey Reset Test

This test is used to test for model mis-specification. The hypothesis is formulated as follows:

H₀: Model is not mis-specified

H₁: Model is mis-specified

Table 7: RAMSEY RESET TEST

Ramsey RESET Test			
Equation: UNTITLED			
Specification: BOP BOP(-1) MOS C			
Omitted Variables: Squares of fitted values			
	Value	df	Probability
t-statistic	1.305318	36	0.2001
F-statistic	1.703855	(1, 36)	0.2001

Evidently, the null hypothesis is accepted since the probability value of F-statistic is 0.2 (> 0.05). Thus we accept H_0 and conclude that the model is mis-specified.

4.6.5 Multicollinearity Test

Multicollinearity test is used here to ascertain the violation of the assumption of randomness of the classical linear regression model. In carrying out the test, we made use of the correlation matrix table. The result is shown in table 7 below.

Decision Rule:

If the pair-wise or zero-order correlation coefficient between two explanatory variables is high, say in excess of 0.8, then multicollinearity is a serious problem (Gujarati and Sangeetha, 2007).

Table 7: Correlation Matrix. Series: MOS

	MOS
MOS	1.000000

From the result in table 7, the partial correlation in the correlation matrix is greater than 0.8. Thus, there is a strong problem of multi-co-linearity in the model.

V. Conclusion

Nigerian economy is external sector driven, which suggests the dependence of the economy on external sector to generate foreign exchange to import capital goods for increased economic activities in the real sector. This empirical study made use of ARDL Bound Test to estimate the relationship between the dependent and the independent variables. The results showed long-run statistical significant impact of these variables (exchange rate, inflation rate, interest rate, money supply) on balance of payment. This implies that the increase in these variables would lead to an improvement in the balance of payment. However, the study found a long run negative and insignificant relationship between the money supply and balance of payment. A real depreciation of the naira would lead to the downturn in the current account balance.

5.1 POLICY RECOMMENDATION

The study recommends that the policy makers should take keen interest on how best to improve the value of Nigeria's export to the world, this will help bring to equilibrium the exchange rates that play an important role in determining the balance of payments.

The government needs to increase marketing of its exports, create awareness among local entrepreneurs of existing export market that need to be exploited while giving incentives to local industries producing for export as well as those companies that assemble locally which help curb demand for imports.

The study further recommends that policy makers should come up with the best way to fund government project or budget deficit other than public borrowing that is on the rise and as observed from the study. It is a major contributor to increase in BOP deficit.

From the foregoing analysis, it is evident that selected macroeconomic variables impact balance of payment in Nigeria, which suggests that all factors influencing these variables have direct consequences on improving the current account position. Therefore, to improve domestic output growth and current account balance in Nigeria, policy must address issues of low productivity, external competitiveness and factor productivity. To this end, we recommend that huge investment should be channelled to infrastructure development to generate more economic activities, reduce the cost of doing business and improve factor productivity in Nigeria. By doing this, the external sector performance would be boosted by higher productivity and robust current account balance.

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